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YIELDS OF RUBBER FROM BUD-GRAFTED TREES ON KAJANG ESTATE, SUNGEI REKO DIVISION.

F. G. Spring.

IT was suggested to Major Gough, by the writer, that the interesting and valuable information being obtained of records of yields from budded and non-budded trees on Kajang and Sungei Reko Estates, might be of general service if recorded by the Department of Agriculture. Major Gough very kindly placed the area in question at the disposal of the officers of the Department of Agriculture, F.M.S. and S.S. and the first records were taken on 4.12.1925. This estate is one of a group controlled by the Hon'ble Mr. R. C. M. Kindersley, who is interested in bud-grafting.

Mother Trees.—No records of yields of the mother trees from which buds were taken (selected from trees on Kajang Estate) were kept but they were known as having given very high yields for a number of years. The trees were 13 years old when used for budding purposes. Major Gough informs me that each mother tree showed latex vessels much above the average.

Stock.—The source of seed was miscellaneous. They were not selected in any way. The seeds were planted in the field, at stake, and budded on to when one year old.

Control Trees.—(non-budded trees.) The number of control trees distributed throughout the budded area occupied by Clones 1 and 9 is 31. These trees were at the time of writing, approximately 5 years old.

The trees from which these test yields were obtained were selected indiscriminately throughout the area previous to the first day's experimental tapping. As far as was possible the control trees were selected adjacent to the budded trees from which the writer took yields.

Bud-grafted Rubber. - The budded area which has been tested by tapping on Kajang and Sungei Reko Estates is approximately 70 acres in extent. The land was opened up from virgin jungle and most of the timber cleared previous to planting. The ground is undulating. The soil is a light clay loam except in one area where it is of a gravelly nature. *Centrosema Plumieri* was planted in the early

stages of development of the property and a system of catch-pits put in with the result that there has been little or no soil erosion.

Budding in the field commenced in October and November 1921. The time from cutting back the seedlings up to the beginning of December 1925, is approximately 4 years. Major Gough has secured a very high yielding Clone No. 1, one group of which contains 308 trees, also a mixed Clone of 94 trees, Nos. 1 and 9, which he has not yet been able clearly to identify and in addition a few other unidentified trees. No. 1 is considered to be probably the best clone discovered out of 70 acres of bud-grafts, tapped on Kajang Estate. Distances of planting 20' × 20'=108 trees per acre. Tapping commenced in the last week in August, 1925, on a half spiral daily cut at 20 inches from the ground which was continued for five and half weeks and rested for a similar period. On November 8th, 1925, the half spiral left cut was re-opened and the system of tapping was changed to alternate day tapping. When the writer commenced taking records on 3.12.1925, 4 inches of bark had been removed:—

Bark consumption=approximately 4 inches for $2\frac{1}{2}$ months.

No. of Trees tapped per coolie = 310.

Tapping commenced 6.15 a.m.

The same coolie (a Chinese woman) taps all the experimental as well as the control trees.

The trees are now being rested, but when they are brought into bearing again it is proposed to take further records.

Fourteen records of yields were made by the writer, who visited the estate on each occasion, saw tapping conducted, and himself collected and took away the latex. The rubber was subsequently weighed at the office of the Department of Agriculture, F.M.S and S.S., Kuala Lumpur.

The tapping was not conducted for the purpose of enabling the writer to take records. The writer visited according to his own convenience and took records from the trees mentioned in the tables on the dates given.

The following are the results obtained from some of the trees of Clone 1, some of those in mixed Clones 1 and 9 including a few unidentified trees, and the control trees. It should be mentioned that December, 1925, was an exceptionally wet period and that this month is generally considered to be the highest yielding period of the year. The last two readings, however, were taken during a relatively dry spell. It is hoped to take further readings in April as this is generally the poorest yielding month of the year. Although it is realised from a statistical point of view that it would not be correct to arrive at any definite conclusions, these figures obtained do show remarkably higher yields in the case of the budded trees.

Average girth at 17" from ground of trees in Clone 1=21.66 ins.
" " " " " " in Clone 1 & 9=21.18 "
" " " " " " Control=22.8 "

The control trees have an average excess girth at 17 inches from the ground over trees in Clone 1 of 1.14 ins. and over the trees in the mixed Clones of 1.62 ins.

The measurements of girth given for trees of Clone 1, show that the girths at 39.37 inches and at 17 inches are very nearly the same, an average of 20.49 against an average girth of 21.66, a difference of 1.17, showing that the girth at nearly ground level and at 3 feet is very nearly equal in bud-grafted trees.

YIELDS OF DRY RUBBER FROM TEST TREES IN CLONE 1.

Average Yield per tree from 17 trees on 4.12.25 = 17.3 grms.
" " " " " 17 " on 10.12.25 = 17.5 "
" " " " " 17 " 12.12.25 = 17.2 "
" " " " " 17 " 8. 1.26 = 15.6 "
" " " " " 16 " 12. 1.26 = 14.1 "

YIELDS OF DRY RUBBER FROM TEST TREES OF MIXED CLONES 1 & 9.

Average Yield per tree from 15 trees on 16.12.25 = 23.9 grms.
" " " " 14 " 18.12.25 = 22.2 "
" " " " 15 " 22.12.25 = 18.1 "
" " " " 15 " 7. 1.26 = 15.4 "

YIELDS OF RUBBER FROM CONTROL TREES.

Average yield per tree from 15 trees on 16.12.25 = 6.5 grms.
" " " " " 15 " 18.12.25 = 6.4 "
" " " " " 15 " 22.12.25 = 5.7 "
" " " " " 14 " 7. 1.26 = 4.7 "

Clone 1.—The highest average yield in those trees of Clone 1, which were included in these tests, is from tree No. 126, giving 24.5 grms. per tapping. The poorest yielder of the test trees is tree No. 222, giving 9.1 grms. per tapping.

Mixed Clones 1 & 9.—The highest average yield in those trees of the mixed clones which were included in these tests is from tree No. 590, giving 28.7 grms. per tapping. The poorest yielder is tree No. 591, giving 12.3 grms. per tapping. This group was tapped on alternate days to Clone 1.

Control Trees.—The highest average yield is from tree No. R 20 giving 12.6 grms. per tapping. The poorest yielder is tree No. 53, giving 2.3 grms. per tapping.

The following yields per acre. per annum, are calculated on 160 tapping days and 80 trees to the acre :—

2.5	grms.	per tree	per tapping	= 70.6	lbs.	per acre per annum.
5	,,	,,	,,	= 141	,,	,, ,,
10	,,	,,	,,	= 282	,,	,, ,,
15	,,	,,	,,	= 423	,,	,, ,,
20	,,	,,	,,	= 564	,,	,, ,,
25	,,	,,	,,	= 705	,,	,, ,,
30	,,	,,	,,	= 846	,,	,, ,,

The characteristics of these budded trees are, low branching, similarity in appearance of trees of the same Clone, large leaves and dark green foliage and clean bark. The bark renewal of the budded trees appears to be satisfactory.

Major Gough informs me that my indiscriminate selection of test trees is apparently going to show an average typical of the whole 308 trees of Clone 1, and of the mixed clones. He informs me that all the 308 trees were marked out before tapping and that no tree has been excluded or brought in since tapping began.

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TABLE I.

YIELD FROM BUD-GRAFTED TREES ON KAJANG ESTATE, SUNGEI REKO DIVISION.

Clone 1.

Tree No.	Girth at 39.37 ins.	Girth at 17 ins.	Yield of latex in c.c. on 3.12.25	Dry weight of rubber in grams.	Yield of latex in c.c. on 9.12.25	Dry weight of rubber in grams.	Yield of latex in c.c. on 11.12.25	Dry weight of rubber in grams	Yield of latex in c.c. on 8.1.26	Dry weight of rubber. in grams.	Yield of latex in c.c. on 12.1.26.	Dry weight of rubber in grams.
	ins.	ins.										
221	21.25	23.25	93	20.5	63	16.9	76	19.0	70	19.4	48	14.2
218	19	20.75	112	22.0	83	19.4	83	17.8	53	14.2	54	15.0
217	19.50	21	132	24.5	70	17.0	60	14.4	64	18.0	40 loss in	11.1
173	20.50	22	111	20.7	45	12.2	52	14.1	33	9.5	44 latex	14.0
172	21.75	23.25	53	13 5	54	14.8	53	14 6	75	19.0	68	18.0
171	18.75	19.75	74	9.5	34	8.2	44	11.4	85	15.5	62	11.5
168	21.25	23	98	22.5	152	30·1	120	24.0	73	14.7	spilt	—
222	20.25	21	34	9.2	30	9.4	44	13.0	25	7.3	14	7.0
216	19	19.50	78	19.5	81	19.4	78	16.7	40	10.9	32	9.7
215	19.75	21.25	114	19.0	73	18.5	90	22.5	130	26.0	98	21.1
207	20.50	21	52	13.7	35	9.3	45	11.9	33	8.6	34	9.0
127	21.25	22.50	84	11.5	40	15.5	42	15.7	24	10.0	26	11.4
125	20.75	21.75	44	15.7	60	19.7	54	17.3	56	15.4	54	16 8
126	21.25	22.50	78	24.0	72	21.6	82	24.2	140	51.6	102	21.3
155	20.50	21.25	100	23.8	150	31.6	141	27.6	74	16.7	68	16.3
276	21.25	22.25	28	8.5	42	12.6	38	11.5	32	8.8	26	8.5
367	21.75	22.25	48	15.3	80	22.0	59	16.5	71	19.2	70	21.2
Averages	20.49	21.66		17.3		17.5		17.2		15.6		14.1

TABLE II.

YIELD FROM BUD-GRAFTED TREES ON KAJANG ESTATE, SUNGEI REKO DIVISION.

Mixed Clones 1 & 9.

Tree No.	Girth at 17 ins.	Yield of latex in c.c. on 16.12.25.	Dry weight of rubber in grams.	Yield of latex in c.c. on 18.12.25.	Dry weight of rubbr in grams.	Yield of latex in c.c. on 22.12.25.	Dry weight of rubber in grams.	Yield of latex in c.c. on 7.1.26.	Dry weight of rubber in grams.
	ins.								
70	20	85	14.7	104	16.8	47	10.5	32	8.0
590	23	117	34.0	116	32.0	102	27.7	91	21.3
591	21	66	14.4	67	14.5	45	10.5	39	9.8
584	19.75	81	20.0	74	19.0	75	17.8	32	6.4
1125	21.12	81	19.8	82	19.0	50	11.2	52	10.1
1126	21.75	102	23.0	90	21.1	74	16.5	70	14.0
1179	21.37	162	40.7	87 loss in latex	22.7	114	26.1	93	21.4
1180	20.75	86	21.6	60	15.1	64	16.1	80	18.6
1439	21.88	126	31.5	104	27.8	92	25.0	78	19.5
1348	22.25	121	29 8	94	25.2	97	23.0	76	17.7
287	21.12	95	23.2	90	23.5	83	22.7	72	17.3
284	21.25	88	17.6	115	21.3	50	12.6	49	12.2
235	21.25	135	30.6	141	29.4	78	19.0	85	19.5
220	19.25	72	19 0	86	23.9	56	17.3	74	18.2
170	22	74	18.3	69	spilt	56	15.6	60	17.0
Averages.	21.18		23.9		22.2		18.1		15.4

TABLE III.

Non-Budded Trees.

Yields from Control Trees on Kajang Estate, Sungei Reko Division.

Tree No.	Girth at 17 ins.	Yield of latex in c.c. on 16.12.25	Dry weight of rubber in grams.	Yield of latex in c.c. on 18.12.25	Dry weight of rubber in grams.	Yield of latex in c.c. on 22.12.25	Dry weight of rubber in grams.	Yield of latex in c.c. on 7.1.26	Dry weight of rubber in grams.
4	25	24	4.3	48	4.6	11	3.6	15	3.5
3	24.25	22	5.9	29	5.1	11	3.0	21	4.5
21	19	16	3.3	18	4.2	12	4,2	12	3.1
20	21	13	3.4	13	3.0	13	4.0	not tapped	—
15	32	41	9.6	32	9.0	30	8.8	37	7.5
19	21.88	20	5.8	20	5.9	14	4.1	16	4.4
22	23.50	33	9.2	36	9.4	28	7.9	32	6.7
33	24.50	32	9.5	27	6.8	17	4.8	20	5.7
52	22.37	32	9.3	35	10.0	31	8.7	13	2.6
53	18.25	10	2.0	8	2.7	7	2.1	12	2.6
46	23	14	3.8	19	5.3	20	6.2	23	5.3
R 22	24.25	20	5.1	20	5.8	13	3.4	22	4.0
R 20	25	43	14.5	40	14.5	48	14.3	55	7.2
R 8	22.12	18	4.6	13	3.3	12	3.5	13	3.8
R 6	25.88	24	7.2	20	6.5	18	6.5	16	4.8
Averages.	22.8		6.5		6.4		5.7		4.7

TREATMENT ON 'WET-ROOT ROT' IN MALAYA CAUSED BY *FOMES PSUEDO-FERREUS*.

A. SHARPLES.

ATTENTION has been focussed on this root disease of *Hevea brasiliensis* during the last few years, some observers regarding this disease as one of the possible limiting factors with reference to the longevity of plantations. A typical infection, when seen, is very impressive, the subterranean habit of the fungus giving but little indication of the number of trees infected. Recently, work has been in hand which indicates that it may be advisable to frame a definite policy with reference to combatting this particular disease. The principal features relative this disease may be briefly mentioned :—

Belgrave (1) first investigated this disease in Malaya but as only imperfect fructifications were found in nature, the causal fungus, isolated from diseased tissue, was named provisionally *Fomes psuedo-ferreus*. The disease is characterised by a typical "Wet-Rot" of the roots—the diseased tissue being quite spongy and wet, even in dry soils. The diseased tissue seldom appears above ground level ; in surface roots it is common to see the upper part, not in contact with the soil, free from attack, while the under portion, in contact with the soil, is badly rotted. The disease assumes its worst form in old plantations and in some old properties a large percentage of trees can be found, suffering from this disease.

Van Overeem and Steinmann (2) have described a similar disease in Java and consider the cause to be a fungus named *Ganoderma ferreum*. The writer (3) has previously stated his opinion upon the position taken up by these authors.

The method of spread of this disease in Malaya is by "root-contact" ; no mature fructifications have been found in this country as yet, therefore spread by spore dispersal cannot be of much significance. It may be mentioned here that three immature fructifications of what appeared to be a *Fomes* sp, were found in close association with one of the diseased trees ; it is extremely unlikely that these specimens would have developed into the *Ganoderma ferreum* of the Javan investigators (2).

The common method of preventing spread of root diseases, i.e. by means of various systems of isolation trenches, has appeared to be useless with reference to "Wet-Root Rot" and advice on the spot for each particular infection, has been considered by the writer as the only satisfactory method of procedure ; if the infection was heavy the only method to be recommended was the isolation of the infected group from healthy portions of the estate by means of a continuous trench, without attempting to save individual trees by connecting trenches.

Some months ago an estate with trees of 12—14 years of age first noticed numbers of trees being attacked at the roots. Examination showed typical "Wet-Root Rot" symptoms and advice was given along the usual lines—i e. trenching and the uprooting and burning of badly diseased specimens. The Manager, as a matter of interest,

began to follow up the lateral roots of diseased trees to their distal extremities and the position as revealed by this very careful and expensive work became exceedingly interesting.

The basis of advice regarding the measures to be adopted in combatting root diseases, is that of how many trees can be saved for the money expended. Up to the present, it has been a fairly general opinion that no positive evidence could be adduced in the way of actual number of trees to be saved by treatment; the underlying idea has been that preventive measures were necessary in order to prevent spread of the disease to healthy portions of the estates. However, the facts to be presented, incomplete though they be, are of such interest, that it may almost be claimed that a complete change of view may be necessary with regard to consideration of treatment of this particular root disease.

After the opening of the first group of trees, it was decided to carry on in the same way for one month before tabulating the figures. The method of operation, was to take a diseased group, and mark all the obviously diseased trees. Badly diseased trees were immediately taken out; the neighbouring trees were next examined and all the roots carefully followed out to their distal extremities often twenty to thirty feet away from the trunk; if any of these trees were found diseased, the opening up was continued to the next neighbouring tree, until healthy trees were found in all directions. This careful examination disclosed the fact that a large percentage of trees could be found, the lateral roots of which were attacked at some distance from the trunk and that by excision of such roots behind the infected portions the disease could be prevented from travelling into the trunk, thus saving a valuable tree which was already infected. Further, careful digging to a depth of three feet showed that the disease was characteristically confined to lateral roots growing in the upper nine inches of soil, so that there was little danger of the fungus gaining an entry into the tap root at a lower level. The first month's figures, July 1925, were as follows:—

No. of trees Examined.	Found Healthy.	No. treated by severance of Lateral Roots.	Badly diseased trees cut out.
98	57	23	18

These figures, seem to the writer, to have much significance. Had the work been carried out less thoroughly, twenty three trees (= 23%) already carrying the disease would have remained standing in the treated area. This means that, in years to come, another and more extensive batch of trees would have to be taken out, and the vicious cycle would continue until large acreages would be involved. The method adopted in this particular case, should be considered not only in saving actually diseased trees, but in preventing infection in the fifty-seven trees found healthy, which were in such close proximity as to be suspected of carrying the disease.

It is important to know how long the work would continue to give figures of the above order. Figures for five months have been obtained and are presented in the table below. There has been some difficulty in keeping the work going owing to labour difficulties, so that in some months less work was done than in others.

Month.	No. of trees examined	No. found Healthy.	No. treated by severance of Lateral Roots.	No. of badly diseased trees cut out.
August -	209	139	41	29
September -	182	83	33	66
October -	64	10	23	31
November -	175	84	45	46
December -	123	40	43	40
Totals -	753	356	185	212

The totalled figures show over the working period practically the same order of figures as was found at the commencement; on the diseased groups treated over fifty per cent—397 against 356, of trees were diseased; of this figure it is claimed that 185, practically twenty-five per cent of the total number of trees opened-up, were saved by the treatment and that this percentage represents actual capital saved. There appears little reason to doubt that if the 185 infected trees, had not been traced down, but had been left standing, that in a few years time further large losses from the same cause would have had to be recorded.

Without going into details, the cost per tree opened has worked out at just under $3/- per tree, and a total of approximately $2250.00 has been spent on the work.

The trees treated by severance of roots can be divided into two classes:—

(a) Trees which require severance of lateral roots, usually many feet distant from the tree; this class is larger in numbers than the next class 'B' and the cutting of a root of small diameter cannot affect the tree to any great extent.

(b) Trees which have been infected for such a length of time that the fungus has had time to grow along the lateral root till the junction of stem and root is almost reached; cutting of roots of large diameter means severe root pruning and some effect might be expected.

A few trees only of the above 'B' class have showed evidence of severe root cutting. On the last inspection these trees showed signs of progress and were looking healthier than at the time of treatment.

The work is being carefully controlled and a further report will be prepared at a later date. Meanwhile further efforts should be made to study this disease along these lines. It appears probable to the writer that if this disease works according to the plan exposed in this particular instance, that, if taken in its earliest stage, after the first cases are found, work of this description will materially aid in actual control. Judging by the figures obtained, the disease might be suspected to work in cycles; the first cycle appears some time about the tenth year or after, the second cycle after the fifteenth year and so on. The second cycle would appear to be dependent on the number of trees already carrying the disease which are exposed by following up the roots of apparently healthy trees in proximity to diseased trees; these trees fall in the group which can probably be saved by treatment. The writer would emphasise that this method is only likely to be economically sound if the disease is tackled in the earlier stages i.e. during the first cycle.

The "Dry-Rot" caused by *Ustulina zonata* (Lev.) Sacc. has been considered in connection with the above work. It is found that the remarks regarding treatment of "Wet-Rot" do not apply to attacks by *Ustulina zonata*. Further remarks regarding this phase of the question may be left for future consideration; the important point at present is to draw the attention of other investigators to the possibility of controlling what is regarded as one of the most serious diseases on mature rubber trees in Malaya. Costs are heavy, but no matter what method of calculating costs of treatment is adopted, the writer thinks that a good case for treatment along the lines indicated has been made out in this particular case, and as long as figures of the same order as tabled are obtained, advice to continue the work should be given.

(1) Belgrave, W.N.C. - A "Wet-Rot" of Para Rubber. Bull. No. 28, Dept. of Agriculture, F.M.S. (out of print).

(2) Overeem van C. Dr. and Steinmann A. Dr. - Over de Roode Worteschimel van *Hevea Brasiliensis*, Archief Voor de Rubber Culture, Oct. 1923.

(3) Sharples, A. - Some observations on Root Diseases of *Hevea Brasiliensis*, Malayan Agr. Journal, Dec, 1924, Vol. XII, No. 12.

Note.—Since going to press a review of a paper by Dr. C. Van Overeem has appeared in the latest issue of 'The Review of Applied Mycology'—Vol. V. Part 1. Jan. 1926. The paper is entitled—'Beitrage zur Pilzflora von Niederlandisch Indien. II. (No. 10-13.) 13. Ueber den roten Wurzelpilz. (Contribution to the fungus flora of the Dutch East Indies. II. (No. 10-13.) 13. (On the Red Root Fungus)—Bull. Jard. Bot. Buitzenzorg, Ser. III, VII. 4. pp 436-446, 1 fig. 1925.

The article is extracted as follows:—

"The author's and Steinmann's previous identification of *Fomes ferreus* with *F. psuedoferreus*, and the use of the name *Ganoderma ferreum* (Berk.) v Overeem & Steinmann for the fungus described by Miss Wakefield under the second of these names, (Kew Bull. 1918, 6, p. 208) are stated to be incorrect. Subsequent investigations of material from Samoa, identified by Lloyd as *F. ferreus* has enabled the author (Van Overeem) to come to the following conclusions. *F. ferreus* (Berk) and *F. psuedoferreus* (Wakef) are two distinct species. The Java red root fungus is *certainly identical* (italics mine. A. S.) with that from the Straits Settlements known under the latter name. The species belongs to the genus *Ganoderma* and should now be known as *G. psuedoferreum* (Wakef) Van Overeem et Steinmann, nov comb, with the following synonyms:—

F. psuedoferreus. Wakef.

G. ferreum. V. O. & Stein. non *Fomes ferreus* (Berk)?

Poria hypobrunnea. Petch?

Poria hypolaterita. Berk.

Trametes theae. Zimm.

A full description of the fungus is given."

The writer has previously stated his disagreement with the views expressed by Dr. C. Van Overeem, and work over another twelve months leads to an emphasis of this disagreement. It is difficult to understand Van Overeem's assertion that the Java red root fungus is certainly identical with that from the Straits Settlements when the latter was named *F. pseudoferreus* by Mifs Wakefield from an imperfect specimen, as a matter of convenience, this diagnosis to be confirmed, or otherwise, when later specimens were found and sent for examination; as far as the writer is aware no further authentic specimens from Malaya or the Straits Settlements have been examined by Mifs Wakefield.

In a previous paragraph in this article it was stated that immature fructifications had been found recently but unfortunately these did not reach maturity; however, while the writer cannot claim to have any specialised systematic knowledge, it is difficult to visualise these fructifications developing into anything closely approaching the specimen of *G. ferreum* sent by Dr. Van Overeem from Java to the writer. Further, it does not seem possible that this Javan specimen could be confused with any *Poria* or *Trametes* species as he suggests in the synonomy. The writer still maintains the attitude expressed in a previous article (3):—that all doubts can be set at rest if pure cultures from Javan specimens could be established and the results compared with those obtained by Belgrave (1) in 1916.

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GAMBIER (GAMBIER UNCARIA). ITS EXTRACTION AND VALUATION.

B. J. Eaton and R. O. Bishop.

THE examination of a number of samples of gambier has resulted in the collection of some data which it appears to be desirable to place on record.

There is no literature available to indicate whether gambier extracts which are suitable for tanning and which have a particular value in the leather industry would be entirely suitable to the silk dyer for use as a colour mordant. Having regard to the other uses of tannins e.g. in pharmacy, in beers and as a masticatory, it is unlikely that a vegetable extract prepared according to native practice will be uniformly applicable for all industrial purposes. It is therefore a matter of some importance to those interested in the production and marketing of gambier to have at their disposal any facts relative to the preparation of a standard commercial product.

The commercial gambier which is offered as "cube," "bale," or in small discs or squares for chewing, contains, in addition to the catechol-tannin substance, a varying amount of water, vegetable acids and their salts, sugar, starch, and cellulose. The present record relates to the analysis of twenty representative samples of gambier supplied by commercial firms in Singapore.

Preparation for Gambier.—In order to obtain criteria for the examination of commercial samples a series of extracts were made from plants grown on the Government Experimental Plantation, Serdang. The plants were growing strongly in three one acre plots from seed planted in January 1924. The plants were eighteen months old when cuttings were taken for the first time. The cuttings were taken from the young leaf shoots and twigs early in the morning and the extract was made about midday. The most convenient practice was to boil the leaves or twigs in batches of 5 lbs. with 4 gallons of water in an open steam pan with constant stirring for 60 minutes. The exhausted cuttings were then removed and the hot liquor strained through muslin. The liquor was then concentrated in an open pan at a temperature below boiling point until a trial sample solidified on a cool watch glass. The solidified extract prepared under those conditions was found to have a light mustard yellow colour. It had a moisture content of approximately 5% per cent. and was slightly sticky with the consistency of butter. The acidity of an aqueous solution was about pH 5.5.

It is important here to draw attention to the influence of certain factors on the characteristics of the solidified extract.

(*a*) *Freshness of Cuttings.*—The leaf cuttings must be as fresh as possible. Trials made on leaves which had been stored in covered pans for varying periods before extraction gave yields of dry gambier of which the following figures are typical.

Thirty six pounds of leaves plucked 6 a.m. on the 21st divided into 5 lb. lots A, B, C, etc.

Lot A. Extracted 1 p.m. 21st. Yield of extract 457 grms. A good firm, yellow Gambier containing 237.5 grms solid matter. Ash 5.6 per cent. Acidity pH : 5.5.

Lot B. Extracted 2 p.m. 21st. Yield of extract 573 grms. Ash 5.45 per cent. Acidity pH: 5.5. A good firm yellow gambier containing 262.0 grms solid matter. Ash 6.0 per cent.

Lot C. Extracted noon. 22nd. Yield of extract 174 grms. A reddish brown mud containing 100 grms solid matter. Ash 8.02 per cent. Acidity pH : 6.0.

Lot D. Extracted noon. 23rd. Yield of extract 268 grms. Ash 11.95 per cent. Acidity pH: 6.5. A red liquid mud containing 37.5 grms solid matter.

Lot E. Extracted noon. 24th. Yield of extract 168 grms. A red mud, which would not solidify, containing 41.1 grms solid matter. Ash 13 61 per cent. Acidity pH: 7.0

Extracts A & B are equal to the highest priced commercial samples but it is doubtful whether the extracts C, D or E are marketable.

(*b*) *Temperature of Extraction.*—The temperature of extraction has an influence on the character of the extract. Although no data can be recorded to show the variation of yield of tannin obtained under the influence of variations in the temperature of the extracting liquor it is evident that the optimum results will be obtained at a temperature which is sufficiently high to cause a maximum solution of tannin with a minimum decomposition of dissolved matter. The decomposition is due to oxidation and could be reduced by extraction in closed vessels. In the present instance as an open pan was used it was found that a temperature of about 80°C was the most suitable. The best results would be obtainable by a counter current system in which fresh water meets partially extracted leaves.

(c) *Acidity of liquor.*—The acidity of the liquor has an influence on the proportion of solid matter which remains soluble. Though it may not be possible for the gambier producer to adjust exactly the acidity of his extract liquors, it is well to bear in mind the desirability of maintaining the solution sufficiently acid to keep the colour of the evaporated extract from turning brown and becoming insoluble in water. The work carried out at the Department of Agriculture shows that an acidity represented by about pH 5.0 gives the best results. This is in agreement with the value determined by

Wilson and Kern(a) as being most suitable for a vegetable tanning liquor. In the case of extracts from absolutely fresh young leaves and twigs the naturally ocurring acidity of the liquor cannot be improved upon but experience has shown that extracts from old cuttings are insufficiently acid, while some extracts made from a wild gambier, *jasminflora*, were somewhat too acid for optimum results.

(d) *Temperature of Evaporation of Extract.*—Although no experiments were made on the evaporation of the extract at low temperatures, it is known that this method is practised by one or more European estates in Sumatra, and results in a gambier of high quality and good colour.

Examination of Gambier Prepared at the Department of Agriculture.

It was found that by adopting a few simple precautions suggested by the facts already described but without recourse to any apparatus other than that used by the native cultivator it was possible to prepare a "bale" gambier with a uniform light mustard yellow colour and almost entirely soluble in water. Owing to the moisture content (approximately 50%) it is not possible to prevent mould growth without using a mild fungicide.

Microscopical Examination.—A pure gambier extract when examined microscopically was seen to consist very largely of minute needle-shaped crystals. No vegetable debris was present and there were no amorphous aggregates and no starch. When the sample was gently warmed the needle-shaped crystals melted to a brown fluid, this on cooling deposited typical crystals of calcium oxalate which were seen to be surrounded by a semi-transparent brown medium. A series of samples were prepared at the Department of Agriculture to contain varying proportions of added starch and china clay. It was found that quite small proportions of adulterants could be distinguished microscopically as the appearance of pure gambier before and after melting is very characteristic.

Chemical Examination.—The unadulterated fresh extract from the leaves and twigs of gambier should normally be almost entirely soluble in water and contain only a small proportion of inorganic matter. The latter consists chiefly of calcium salts and should be almost entirely soluble in hydrochloric acid. In the samples prepared at the Department of Agriculture the following constants were determined :—

Moisture, Ash, Total Soluble, Non Tannin Solids. It was found that determination of the optical rotation of the aqueous solution could not be used satisfactorily for analytical purposes.

The results of some analyses are recorded in Table I.

(a) J. Ind. Eng. Chem 14 (1922) 1128.

TABLE I.

Sample.	Origin of Sample.	Moisture content per cent.	Acidity pH. Value.	Calculated on the Dry Extract.			
				Ash content per cent.	Total Water soluble solids per cent	Soluble Non-tannin solids per cent.	Tannin Soluble per cent.
A 7/10	Leaves and twigs Govt. Expl. Pltn.	27.1	5.5	5.0	100.0	57.8	42.2
B 7/10	Leaves from old branches Govt. Expl. Pltn.	45.9	6.0	4.0	100.0	47.9	52.1
D 7/10	Very young leaves. Govt Expl. Pln.	51.0	5.0	4.4	93.0	48.2	44.8
E 7/10	Wild Gambier from secondary jungle.	42.5	4.0	...	51.2	30.1	2.11
B 12/10	Wild Gambier from secondary jungle.	70.0	4.5	...	56.6	46.0	10.6
$A^1$12/10	Leaves from good growth Govt. Expl. Pltn.	48.3	5.5	5.6	100.0	56.0	44.0
$A^2$12/10	Leaves Ditto after 4 hours storage	54.4	5.5	5.4	90.0	48.0	42.0
X_1	Leaves and twigs from estate.	53.3	5.0	5.36	90.0	41.7	45.3
X_2	Commercial Gambier Prepared on estate.	21.94	...	9.26	85.80	47.42	38.38

The effect of a month's storage on a moist gambier without preservation and therefore under the deteriorating influence of a heavy mould growth and oxidation is illustrated by the following figures obtained by duplicate analyses on the first three samples above.

A /710	Leaves and twigs	26 8	...	...	92.8	50.1	42.7
B 7/10	Leaves ...	45.6	...	...	91.9	41.8	50 1
D 7/10	Very young leaves.	46.8	...	...	88.3	38.5	49.8

The analytical procedure adopted was briefly as follows :—

Moisture—This was determined by adding to a known weight of gambier in a flat bottom dish a few ccs of alcohol and heating to constant weight in a vacuum oven at 70°. C.

Ash.—This was determined by igniting the dry residue at a very dull read heat in an electric furnace. The ash was almost colourless for pure samples.

Total Soluble.—Seven grams of the sample were added to 200 ccs of hot water, heated for a few minutes on a steam bath and then made up to 1000 ccs with cold water. The solution was adjusted as soon as thoroughly cool and then 5 grams of washed kaolin were added. The whole was shaken for 15 minutes and allowed to stand overnight. The liquor filtered clear and bright after such treatment. For the estimation of "Total Soluble" 50 ccs were evaporated on a water bath and dried to constant weight at 70°C in a vacuum oven.

Soluble Non tannin.—This was estimated on 100 ccs of filtered liquor by the addition of 7 grms. of fresh dry chromed hide powder. The hide powder was shaken with the liquor for 15 minutes in a glass stoppered bottle. The whole was poured on to a filter paper, the first runnings were tested with gelatine salt solution to ensure the presence of excess hide powder and, if satisfactory, 50 ccs of clear filtrate were evaporated and dried as above. The acidity of the solution was adjusted to pH. 5 5 before the addition of the hide powder. (Note :—The importance of uniform acidity has been shown by Wilson and Kern) in their valuable contributions to the study of tannin materials (*b*).

A series of representative market samples were obtained from commercial firms dealing in this product who supplied the market prices ruling at the time. The results of a chemical examination of the samples are given in Table II. and and for comparative purposes the cost per unit of soluble tanin has been calculated and recorded for each sample.

Conclusions.—From these figures it is interesting to note how widely the commercial values of samples differ from their value in soluble tannin content and also how the total solubilities of the samples vary. With the exception of the two "cubes" Nos. 1 and 17 which are obviously adulterated with mineral matter, the ash content is comparatively uniform and agrees well with the figures found for pure gambier prepared at the Department of Agriculture thus indicating the lack of any widespread adulteration with inert substances, a practice which was apparently common in the East Indies a few years ago (*c*).

(b) The Chemistry of leather Manufacture. Wilson.

(c) "Gambier and its Adulteration" by Dr. J. T. Temminck Groll 1920. No. 3 Berichten v.d. Afdeeling Handelsmuseum v.h. Koloniaal Institute. Datch text.

Summary.—Information is given on the preparation of pure gambier and data recorded for the analyses of what are considered to be good standard commercial gambiers.

The soluble tannin contents of commercial samples of gambier are compared with the ruling market prices for the same samples.

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TABLE II.

Sample.	Description.	Market Price per picul $	Moisture content per cent.	Acidity pH. value.	Calculated on the Dry Gambier.				Cost per unit Soluble Tannin in Commercial Sample. $
					Ash content per cent.	Total Water soluble solids per cent.	Soluble non-Tannin solids per cent.	Soluble Tannin per cent.	
1	Rhio Cube ...	$25.00	4.5	5 8	61.2	18.8 4	10.74	8.10	$3.22
2	Malacca Cube ...	35.00	14.47	4.8	5.96	79.0	34 90	44.10	0.93
3	Hamburg Cube ...	34.00	15.54	5.0	6.32	78.1	35.06	43.04	0.92
4	Johore Bale ...	18.50	55.41	6.0	3.40	82.92	47.25	35.67	1.16
5	Johore Bale ...	22.50	54.48	5.6	4.46	81.45	46.80	34.65	1.42
6	Johore Bale ...	19.00	54.62	5.4	6.71	97.97	62.71	35.26	1.19
7	Sarawak Bale ...	17.50	41.65	5.8	5 35	72.41	44.24	28.17	1.06
8	Dutch E. Indies Bale ...	18.50	54.91	5.0	6.47	74.71	43.40	31.31	1.07
9	Muar Bale ...	19.00	37.66	4.6	5.29	86.11	49.23	36.88	0.82
10	Tekong Bale ...	18.50	50.01	6.2	5.02	78.87	40.82	38.05	0.99
11	Johore Bale ...	19.00	25.84	5.0	4.11	63.68	39 25	24.43	1.05
12	Sarawak Bale ...	19.00	36.43	4.4	5.55	95.63	68.91	26.92	1.11
13	Singapore Bale ...	23.00	58.83	5.6	5.15	89.23	52.76	36.47	1.53
14	Balai Bale ...	18.00	54.60	5.2	5.99	83.20	55.40	27.80	1.42
15	Java Cube from Rhio ...	26.50	12.90	5.4	6.66	57.15	22.9	34.25	0.89
16	Johore Cube ...	30.00	11.76	5.6	5.99	70.56	36.60	33.96	1.00
17	Pontianack Cube ...	18.00	3.33	5.4	69.88	16.47	8.03	8.44	2.20
18	Malacca Cube ...	32.00	14.05	4.8	7.78	86.77	44.08	42.69	0.87
19	Rhio Cube ...	27.00	12.68	4.6	6.28	78.30	42.55	35.75	0.86
20	Malacca Bale ...	29.00	40.51	—	7.65	96.86	51.88	44.98	1.08

THE PRODUCTION AND MARKETING OF GAMBIER

D. H. Grist.

The attention of planters has been directed, of late, to the possibility of successfully cultivating gambier as a catch crop in rubber and in oil palm plantations—owing to the very high prices which have been obtained for this product during the past two years. The uncertainty of the future prospects however, judged by examination of the violent fluctuations of Singapore market quotations, has, in many cases, proved the deciding factor against planting the crop; but a further reason frequently advanced against gambier is that it exhausts the soil. These two economic factors are deserving of close attention in order that the cultivator may arrive at conclusions which are compatible with profitable planting and good husbandry.

It may be that gambier exhausts the soil, but it must be remembered that this objection applies not only to gambier, but to almost every cultivated crop, in a greater or less degree, according to the weight of plant food removed by the crop and taken from the field by the harvester. The question resolves itself into the extent of loss, by reason of any particular crop, which it is economically possible to replace. The basis of all systems of agriculture is that a crop is economically possible only if it will yield a profit after making due provision for the restoration of fertility.

Attention has been given to this question in Sumatra, with the result that at the present time there are several estates on which gambier is grown as a catch crop with rubber and also with African oil palm. There are also estates on which gambier is cultivated as a sole crop. This is a distinct advance, for it is the first time that gambier has been considered seriously as a permanent crop. It will result in the production of an article of better quality at a lower price, and will also tend to stabilise market prices, which hitherto have been dependent upon the amount of land being opened for other crops. Whether the establishment of these gambier plantations will result in over-production is uncertain, but owing to the large local demand for gambier as a masticatory—a demand which is increasing—there is, at present, but a comparatively small quantity of gambier exported, i.e. small as compared with the probable world demand. The writer has been informed that the world demand for gambier is about 25,000 tons per annum. This obviously does not take into account the amount consumed as a masticatory by the natives of the Malay Archipelago.

Production of Gambier.

Netherland East Indies.—Java. A considerable quantity of gambier is grown in Java, but the quantity exported is insignificant; in fact, to counterbalance such exports a quantity from the outer islands of the N.E.I. is imported to satisfy the local demand.

The exports from the outer islands to foreign parts amounted to 5,103 tons in 1923; 6,531 tons in 1922; and 5,901 tons in 1921. The exports were mostly to Singapore, Great Britain, and to a smaller extent, to the United States of America.

Padang in the N.E.I. exported 219 tons 142 and 1,274 tons in the years 1924, 1923 and 1922 respectively.

Sumatra. The cultivation is mostly on the east coast. The exports were 3,300 tons in 1923, and 3,173 tons in 1924; of this total only about 300 tons was the produce of native cultivation: There are several European owned estates planted with gambier in Sumatra, in most cases as a catch crop, but in one or two instances as estates of considerable size on which this crop alone is cultivated.

Malaya.—In the Malay Peninsula, Trengganu has about 5000 acres under this crop; Johore, a little over 1000 acres, while the whole of the Federated Malay States has only about 2300 acres, most of which is in the Negri Sembilan. In considering future supplies, it is as well to remember that with the renewal of activity in rubber planting, and more general interest in African oil palm cultivation, the area under gambier is likely to increase in the near future, and the price of the commodity to shew a tendency to decline.

Summarising the Eastern production of gambier, less the amount consumed in countries of production, the figures are as follows:—

Year.	Sumatra*	Malaya.	Total.
1922	5,244 Tons	3,365 Tons	8,609 Tons
1923	3,128 „	3,247 „	6,375 „

THE TRADE IN GAMBIER.

The export of gambier from Sumatra deserves careful scrutiny. The extent to which Singapore figures as a clearing centre is indicated by the following table.

EXPORT OF GAMBIER FROM OUTER POSSESSIONS N.E.I. 1922 AND 1923.

Countries of destination	1922.		1923.	
	Quantity tons.	Value. £	Quantity. tons.	Value £
Great Britain -	2,372	80,512	1,552	46,076
Holland -	...	—	20	769
Germany -	66	2,228	27	795
France -	635	21,550	353	10,487
Belgium -	92	3,124	60	1,783
Italy -	35	1,180	51	1,519
Switzerland -	29	992	—	—
United States of America.	1,911	64,860	943	27,995
British India -	2	71	—	—
Penang -	75	2,543	90	2,672
Singapore -	1,170	39,707	1,884	55,950
Australia -	17	601	9	263
Japan -	—	—	9	258
Unknown -	10	335	9	278
Total -	6,414	217,703	5,007	148,845

* less amount exported to Singapore.

The opinion of an expert in the N.E.I. on the future of gambier stated as follows :—

> "The area under Gambier cultivation is increasing in "Sumatra; this is, however offset by increased local "consumption; it is therefore not expected in Agri- "cultural circles here that there will be a serious over- "production in the N.E.I."

Malaya.—The gambier trade of the East is centred in Singapore and the following table analysing the position for the last few years is therefore of importance.

Imports and Exports of Gambier (S.S. Trade Returns.)*

Year	Gambier in bales.				Gambier cube.			
	Imports.		Exports.		Imports.		Exports.	
	Tons.	Value $	Tons.	Value $	Tons.	Value $	Tons	Value $
1918	7,576	1,804,018	8,006	2,243,869	2,270	853,709	3,218	1,271,056
1919	6,318	1,405,743	4,121	1,108,960	2,790	969,817	5,350	1,961,094
1920	4,183	876,296	3,747	929,916	2,205	771,257	5,025	1,835,562
1921	2,083	284,539	2,370	373,981	1,537	369,262	4,748	1,050,039
1922	2,678	409,018	2,459	409,999	2,298	570,612	5,882	1,357,625
1923	500	121,726	917	240,543	1,811	655,902	5,385	1,980,427
1924	269	81,260	1,512	661,836	2,585	1,382,318	4,778	2,788,373
1925	394	107,119	1,940	741,142	2,134	1,036,229	3,049	1,859,331

About one third of the Singapore exports go to British India and Burma, various countries in Europe absorb one sixth, the United States of America also one sixth, while the United Kindom and Java also import considerable quantities.

* The S.S. Trade returns were given in piculs till 1923 and thereafter in tons. For the sake of ready reference, the returns have been stated in tons throughout this table.

As will be seen from the above figures, the Singapore trade in bale gambier has steadily declined during the period under review. The actual quantities of imports and exports of cube gambier has been remarkably steady from 1918-1925 inclusive

It must be admitted that gambier sold on the Singapore market gained a bad reputation, owing to the adulteration practised by growers or dealers, and this fact undoubtedly led consumers to employ other substances in place of gambier. With careful manufacture, and the export of reasonably pure gambier, it is probable that the product will regain its popularity, provided that regular supplies are forthcoming ; for, from the manufacturers' point of view, it is a factor of considerable importance that his factory shall not be disorganised, or the quality of his produce vary on account of inability to procure the raw products.

Prices.—The above tables are compiled from Trade returns, which normally include freight, insurance, traders' profit etc. For this reason the following average figures of Singapore prices may be of value.

AVERAGE ANNUAL PRICES* GAMBIER.

(Singapore Chamber of Commerce)

	Average		Highest Quotations		Lowest Quotations.	
	Bale.	Cube.	Bale.	Cube.	Bale.	Cube.
1922	10.19	14.77	...	...	...	...
1923	15.41	28.82	...	...	...	...
1924	25.00	42.36	34.40	49.00	19.00	36.00
1925 (Jan-Oct)	20.45	32.53	25.00	45 00	16.00	22.50

While it would seem from the above figures that there has been but little variation in price between 1923-1925, the following monthly averages for 1925* may be mentioned to show the nervous condition of the market.

	Cube				
	1925	1924		1925	1924
January ...	39	37	July ...	29	42
February ...	39	38	August ...	26	42
March ...	40	40	September ...	25.5	42.50
April ...	38	—	October ...	23	43.50
May ...	32	45	November ...	23.5	44
June ...	28	46	December ...	23.5	41

*Prices in Dollars per picul.

Bale

	1925	1924		1925	1924
Jan ...	22	19	July ...	19	21.50
Feb. ...	24.5	20	Aug. ...	22	25.50
Mar. ...	23	20.50	Sept. ...	20	27
Apl. ...	20	26.50	Oct. ...	17	30.50
May ...	17	21	Nov. ...	16	33 50
June ...	16	21.50	Dec. ...	15	28

To Summarise. The bulk of the supplies of gambier are grown in the N. E. I. and Malaya, where apart from an export trade, there is a large local demand as a masticatory. Exports are chiefly to India, the United Kingdom, the United States of America and Java.

The conclusion may be drawn that the gambier trade is one that, while not capable of enormous extension, is of considerable value. While the future is uncertain, it is probable that there will be an improvement in the quality of the commodity, and that prices generally will be on a lower level on account of increased planting of the crop.

The cultivation of gambier as a catch-crop with rubber or oil palms has been practised with considerable success on some estates, and the writer considers that there is still an opening for the profitable employment of the crop in this connection.

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LONDON MARKET PRICE LIST 4th QUARTER 1925.

Oil Seeds.

Castor (Bombay)	-	£19.10 per ton Nom. (Hull)
Copra (Ceylon)	-	£29.15.0 to £30.15.0 per ton.
Cotton (Egyptian)	-	£11.5.0 ,,
Do. (Bombay)	-	£ 8 5.0 ,,
Croton	-	27/6 to 32/6 per cwt.
Desiccated Coconut (fine)	-	40/- ,,
Do. Do. (Medium)	-	40/- ,,
Do. Do. (Coarse)	-	43/- ,,
Groundnuts (Chinese, decorticated)	-	£22 15.0 ,,
Linseed (Bombay)	-	£21.10 0 to £21.0.0 per ton.
Do. (Plate)	-	£18.5 0

Oils.

Castor (Madras)	-	Nominal.
Do. (Pharmaceutical)	-	59/- to 55/- per cwt.
Do. (1st pressing)	-	51/- to 50/- ,,
Do. (2nd pressing)	-	52/- to 46/- ,,
Coconut (Cochin)	-	64/- to 59/- ,,
Do. (Ceylon)	-	47/6 to 45/9 ,,
Cotton seed (Egyptian, crude)	-	£37 per ton.
Groundnut (oriental, crude)	-	50/- to 44/- per cwt.
Linseed (Calcutta)	-	Firm and dearer.
Palm (Lagos)	-	£38 to £40 per ton.
Palm kernel 5½% (L'pool)	-	£43.10.0 to £44.10.0 ,,

Oil Cakes.

Coconut	-	£10.2.6 to £9.17.6 per ton
Cotton (Egyptian seed)	-	£8.5.0 to £7.17.6 ,,
Do. (Bombay seed)	-	£6.17.6 to £6.12.6 ,,
Groundnut 54%	-	£12.7.6 to £13.7.6 ,,
Linseed 9%	-	£12.10.0 ,,
Palm kernel	-	£7.5.0 to £8.10.0 ,,

Essential Oils.

Cajeput	-	2/11 per lb.
Camphor white on spot	-	70/- to 52/- per cwt.
Do. (oil)	-	60/- ,,
Cinnamon (Ceylon leaf)	-	4½d to 5d per oz.
Citronella (Ceylon)	-	1/10 to 2/4 per lb.
Do. (Java)	-	3/- to 3/9 ,,
Clove	-	6/6 to 7/3 ,,
Lemon grass (Cochin)	-	4/3 to 4/9 ,,
Patchouli (Penang)	-	13/6 to 20/- ,,
Vetiver (Bourbon)	-	55/- to 50/- ,,

Spices.

Capsicum (East Indian)	-	40/- to 45/-	per cwt.
Do. (Nyassaland)	-	60/- to 70/-	,,
Chillies (Zanzibar)	-	37/6 to 45/-	,,
Do. (Nyassaland)	-	50/- to 65/-	,,
Do. (Japan)	-	110/-	,,
Cinnamon (Ceylon)	-	1/9 to 1/11	per lb.
Cloves (Zanzibar)	-	11d. to 1/-	,,
Do. (Penang)	-	2/- to 2/6	,,
Ginger (Japan)	-	82/6 to 85/-	per cwt.
Do. (Jamaica)	-	125/- to 145/-	,,
Mace (Bombay and Penang)	-	3/7 to 4/2	per lb.
Nutmegs (Singapore and Penang)	-		
110's	-	2/3	per lb.
80's	-	2/6	,,
64–57's	-	2/7	,,
Pepper (Singapore black)	-	1/1 to 1/4	per lb.
Do. (Singapore white)	-	1/3¾ to 1/6½	,,
Tumeric (Bengal)	-	50/-	per cwt

Drugs.

Ipecacuanha (Rio)	-	12/	per lb.

Natural dyestuffs and Extracts.

Annatto (seed)	-	5d.–6d.	per lb.
Gambier (block)	-	60/- to 55/-	per cwt.
Do. (cube)	-	75/-	,,

Gums and Resins.

Damar (Singapore)	-	30/- to 155/-	per cwt.
Do. (Batavia)	-	125/- to 155/-	,,
Dragon's blood (reeds)	-	£15 to £20	,,
Do. (lump)	-	£11 to £25	,,
Gutta percha (genuine)	-	2/9 to 6/-	per lb.
Do. (Sarawak)	-	3/- to 4/-	,,
Do. (Siak, reboiled)	-	1/2	,,
Jelutong	-	1/- to 1/6	,,

Fibres.

Cotton (American Go to Mid)	-	13 46d to 10.88d	per lb.
Do. (Egyptian Sakellaridis, G. F.)	-	32.40 nom. to 19.75	,,
Hemp (Manila "J" Grade)	-	£41.10.0 to £43.10.0	per ton.
Do. (Mauritius)	-	£33.0.0 to £48.10.0	,,
Do. (New Zealand)	-	£36.10.0 to £39.10.0	,,
Do. (Sisal)	-	£25.0.0 to £46.0.0	,,
Kapok (Indian)	-	11½d to 1/1d	per lb.
Do. (Java)	-	1/3½ to 1/4½	,,

Foodstuffs.

Cocoa (Ceylon plantations)	-	80/- to 100/- per cwt. (in bond)
Coffee (Malay plantations)	-	110/- to 115/- ,,
Do. (Liberian)	-	100/- to 105/- ,,
Sago (pearl)	-	28/- ,,
Do. (flour)	-	17/6 to 18/- per cwt.
Sugar (Java, white)	-	25/6 to 26/9 per cwt. (excluding duty)
Tapioca (Penang flake)	-	2d to 3d per lb.
Do. (Do. flour)	-	18/- to 22/- per cwt.

Chemicals.

Acetic acid (glacial)	-	£66.5.0 per ton in demi-johns £55 in barrels.
Do. (80% commercial)	-	£39.0.0 per ton.
Acetone	-	£75 to £78 ,,
Ammonia (880)	-	2½ to 3d per lb.
Calcium Acetate (grey)	-	£14.10 per ton.
Citric Acid	-	1/3¼ to 1/3½ per lb.
Formic acid (85%)	-	£47 per ton (Manchester)
Formalin (40 Vol.)	-	£40.15.0 to 41.15.0 per ton
Lime Juice (concentrated)	-	2/3 to 2/9 per gal.
Sodium bisulphate (60-62%)	-	£15 per ton
Sodium sulphate (anhydrous Pea crystals)		£14 ,,
Wood creosote (unrefined)	-	2/7 per gal.

The oil market, and in sympathy with it—the market for oil seeds and cakes—has generally been quiet and in favour of buyers during the quarter : copra has finished firmer, and a better trade is anticipated in most commodities. The oil cake market finished firmer but without much confidence.

Essential oils have shewn an upward tendency ; especially is this the case with cajeput, the market for which has been affected by the report of considerable forest fires in Java in which a large number of cajeput trees has been destroyed. Citronella market shewed a sharp rise, while patchouli continues firm.

Most spices are in good demand, cloves in particular are likely to improve considerably owing to the decrease in stock which now stand at 9,856 bales against 16,274 in 1924 and 21.095 in 1923. The market for pepper is strong and advancing.

With the exception of manila, the fibre markets have been buoyant, but although the business has been good, that with France has been restricted on account of the unsettled financial condition prevailing in that country. The outlook of trade conditions is not yet sufficiently promising to expect any immediate renewal of interest in Manila hemp.

The foodstuffs market has been mostly firm ; most descriptions of cocoa remain in slow demand, sago is firm and tapioca dearer. Sugar has varied a good deal. In this connection it is estimated that the new sugar beet factories in the united Kingdom will, during the next season, have an output of 70,000 tons of sugar. The annual sugar consumption of the United Kingdom averages two million tons, while the world's sugar production this year is about fifteen million tons.

The above average market price list is based on the numbers from October to mid December of the following periodicals and Lists. Lewis and Peat Ltd. Monthly Prices Current (Baltic Dept.), Market Report; and West Indian Monthly ; British Trade Journal, Fertilizers and Feeding Stuffs Journal, Chemist and Druggist, Chemistry and Industry, The Chemical Age and the Perfumery and Essential Oil Record. The figures aim at indicating the trend of the market over the period, as a guide to future movements.

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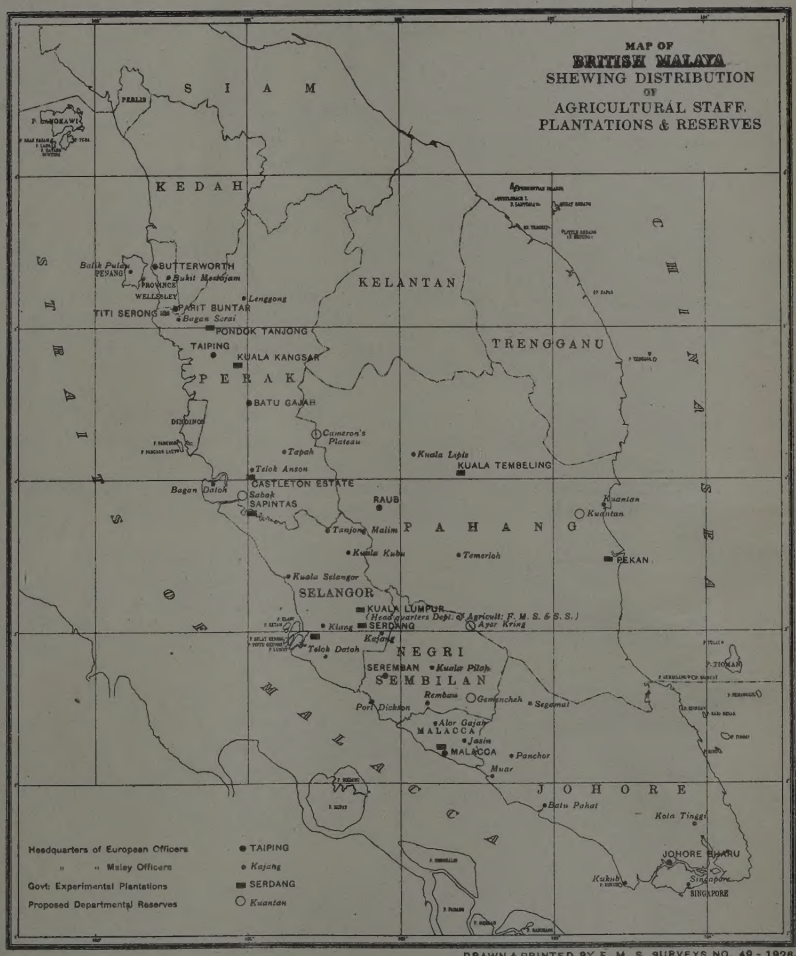

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